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**MEMORANDUM OF AGREEMENT  
BETWEEN**

**U.S. ARMY CORPS OF ENGINEERS,  
INSTITUTE OF WATER RESOURCES,  
HYDROLOGIC ENGINEERING CENTER**

**AND**

**DEPARTMENT OF COMMERCE,  
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION,  
NATIONAL WEATHER SERVICE**

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**ARTICLE 1. PURPOSE AND AUTHORITY**

- 1.0 This Memorandum of Agreement (MOA) is entered into by and between the Hydrologic Engineering Center (HEC) within the Institute of Water Resources of the U.S. Army Corps of Engineers and the Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service (DOC/NOAA/NWS) for the purpose of developing, incorporating, and utilizing models and techniques developed by the Hydrologic Engineering Center into National Weather Service operational software. This agreement is entered into pursuant to the following authorities for DOC/NOAA/NWS and USACE/IWR/HEC to enter into this agreement:
- (1) The Economy Act, 31 U.S.C. 1535, which provides that an agency may place an order with a major organizational unit within the same agency or another agency for goods or services if:
    - (A) amounts are available;
    - (B) the ordering agency decides the order is in the best interest of the United States Government;
    - (C) the agency to fill the order is able to provide or get by contract the ordered goods or services; and
    - (D) the agency decides ordered goods or services cannot be provided by contract as conveniently or cheaply by a commercial enterprise (payments must be made on the basis of the actual cost of goods or services provided); and
  - (2) The NWS Organic Act, 15 U.S.C. 313, and the Flood Control Act, 33 U.S.C. 706.

## **ARTICLE 2. BACKGROUND**

2.0 HEC is the designated Center of Expertise for the US Army Corps of Engineers in the technical areas of surface and groundwater hydrology, river hydraulics and sediment transport, hydrologic statistics and risk analysis, reservoir system analysis, planning analysis, real-time water control management and a number of other closely associated technical subjects. HEC supports Corps field offices, headquarters, and laboratories by providing technical methods and guidance, water resources models and associated utilities, training and workshops, accomplishing research and development, and performing technical assistance and special projects. HEC models and techniques are widely used by public agencies and by the private sector.

The NWS operates thirteen River Forecasts Centers (RFCs) that provide flood and water supply forecasts, guidance, and information for the protection of lives and property and the enhancement of the environment and economy. To accomplish this, the RFCs utilize the National Weather Service River Forecast System (NWSRFS). NWSRFS is a collection of hydrologic models, operations, and data processing functions supported within a well-tested and rigorous operational infrastructure. NWSRFS is maintained by NOAA/NWS Office of Hydrologic Development (OHD).

Yuba County Water Agency (YCWA) is leading an interagency effort to develop “Forecast Coordinated Operations” for Lake Oroville on the Feather River and New Bullards Bar Reservoir on the Yuba River. Representatives of collaborating agencies have agreed to use the ResSim model as the centerpiece model for the decision support system. ResSim is a product of the HEC. In order for ResSim to meet the project requirements, a set of identified enhancements are needed. In addition, ResSim must be compatible with the operations of the NOAA/NWS California-Nevada River Forecast Center (CNRFC), who in concert with the State of California Department of Water Resources (CADWR), provide hydrologic forecast and warning support for the Feather and Yuba rivers during routine as well as flood emergency conditions.

## **ARTICLE 3. SCOPE**

3.0 Services and deliverables to be provided under this MOA are set forth at APPENDIX A. In accordance with the Economy Act, HEC warrants that it can provide the services described in APPENDIX A. Nothing in this MOA shall be construed to require the DOC/NOAA/NWS or HEC to provide funds, goods, or services except as may be set forth in APPENDIX A or in a subsequent Work Order (WO) developed under this MOA and incorporated herein by amendment pursuant to ARTICLE 13.

## ARTICLE 4. INTERAGENCY COMMUNICATIONS

4.0 To provide for consistent and effective communications between HEC and DOC/NOAA/NWS, each party designates the Principal Representative listed below to serve as its central point of contact on matters relating to this MOA.

For USACE/IWR/HEC

Thomas A. Evans

USACE/IWR/HEC

609 Second Street

Davis, CA 95616-4687

Phone: 530-756-1104

Email: [thomas.a.evans@usace.army.mil](mailto:thomas.a.evans@usace.army.mil)

For DOC/NOAA/NWS

Robert K. Hartman

NOAA/NWS/CNRFC

3310 El Camino Avenue, Suite 226

Sacramento, CA 95821

Phone: 916-979-3056, Ext. 322

Email: [robert.hartman@noaa.gov](mailto:robert.hartman@noaa.gov)

Additional representatives may be appointed to serve as points of contact if the complexity of the work effort calls for it.

## ARTICLE 5. WORK ORDERS

5.0 The specific work to be performed under this MOA is set forth at APPENDIX A. All Work Orders (WO), in the form of ATTACHMENTS to this MOA, will be subject to the mutual agreement of HEC (Performing Agency) and DOC/NOAA/NWS (Funding Agency) and will be signed by authorized representatives of each party.

5.1 The Performing Agency will provide no goods or services under a WO until the WO is signed by both parties and the Funding Agency has executed a Determinations and Findings (D+F) under 48 CFR 17.503 pursuant to the Economy Act. Each WO shall contain the following:

5.1.1 A statement of work (SOW) detailing the work items to be accomplished by each participant;

5.1.2 The amount of funds required and available to accomplish the work requested;

5.1.3 Schedule for payments and for completion of tasks;

- 5.1.4 Funding arrangements, including whether payment shall be in advance or by reimbursement;
  - 5.1.5 Funding Agency=s fund citation and the date upon which the cited funds expire for obligation purposes;
  - 5.1.6 Identification of each party's project manager for the WO (see Article 5.2);
  - 5.1.7 Types and frequency of reports;
  - 5.1.8 Identification of which party is to be responsible for government-furnished equipment, contract administration, records maintenance, rights to data, software and intellectual property rights, and contract audits;
  - 5.1.9 A warranty pursuant to the Economy Act that the Performing Agency is able to provide the ordered goods and service or services; and
  - 5.1.10 Such other particulars as are necessary to describe clearly the obligations of the parties with respect to the requested goods and services.
- 5.2 The HEC and DOC/NOAA/NWS will each assign a Project Manager for each WO. Each Project Manager will function much like a Contracting Officer=s Technical Representative and will be responsible for providing coordination, integration, and technical administration of the project. The Project Managers shall regularly meet, or otherwise communicate to: 1) plan work to be performed pursuant to this MOA; 2) propose, draft and coordinate the issuance of new WOs; 3) review and evaluate the progress of the work being performed; 4) prepare the annual budget for all work under this MOA, including any WOs; and 5) monitor the expenditure of funds. The Project Managers do not have the authority to issue or modify WOs without a written amendment.
- 5.3 This MOA will control in the event of a conflict between the MOA and any WO.

**ARTICLE 6. RESPONSIBILITIES OF THE PARTIES****6.0 The Performing Agency shall:**

- 6.0.1 Provide the Funding Agency with goods and services in accordance with the purpose, terms, and conditions of this MOA and any subsequent WOs made part hereof by amendment pursuant to ARTICLE 13;
- 6.0.2 Identify authorized representatives to sign subsequent WOs;
- 6.0.3 Use its best efforts to provide the requested goods or services; and
- 6.0.4 Provide any periodic progress, financial, or other reports to the Funding Agency as agreed to in APPENDIX A or in subsequent WOs.

**6.1 The Funding Agency shall:**

- 6.1.1 Prior to beginning any work under APPENDIX A or any subsequent WOs, execute a Determinations and Findings under 48 CFR 17.503 pursuant to the Economy Act; and
- 6.1.2 Pay all costs associated with the Performing Agency=s provision of goods or services under this MOA.

**ARTICLE 7. FUNDING**

- 7.0 Subject to the availability of appropriated funds, funds will be provided for the work described in APPENDIX A and in each WO issued under this MOA. If the actual cost to perform the work under the WO is forecast to exceed the amount of funds available, the Performing Agency shall promptly notify the Funding Agency of the amount of additional funding necessary to pay for the assistance. The Funding Agency shall either provide the additional funds to the performing agency within fifteen (15) calendar days thereafter, or narrow the scope of the work to be performed, or terminate the WO in accordance with Article 13. Should the Funding Agency not exercise any of the above options, the Performing Agency may immediately terminate work under the WO. In the event of any change, an amendment to the WO is required.
- 7.1 Within 90 (ninety) days of completing the work under a WO, the Performing Agency shall conduct an accounting to determine the actual costs of the work. Within 30 (thirty) days of completion of this accounting, the Performing Agency shall return to the Funding Agency any funds advanced in excess of the actual costs. Such an accounting shall in no way limit the Funding Agency=s duty in accordance with this MOA to pay for any costs, such as contract claims or other liability, which may become known after the final accounting.
- 7.2 Costs incurred by the Performing Agency in executing tasks under this MOA may be billed to the Funding Agency. Billing will be handled through IPAC on a quarterly basis. Billing will be submitted on an SF 1080, Voucher for Transfers between Appropriations and/or Funds, and the Funding Agency shall reimburse the Performing Agency.

- 7.3 The appropriation out of which National Oceanic and Atmospheric Administration/National Weather Service will pay for these services is:

ORF 14-06-D8M5J22-P00-37-04-04-01-005-20-03-0000-00-00-00-00.

NOAA/NWS will provide HEC \$90,000 for the specified activities identified in Statement of Work provided in Appendix A. Subsequent Work Orders related to Appendix A will follow the procedures defined in ARTICLE 5.

The services covered under this agreement will be charged to:

ORF 14-06-D8M5J22-P00-37-04-04-01-005-20-03-0000-00-00-00-00.

This amount will be de-obligated to the extent that the servicing agency has not obligated it before September 30, 2007.

## **ARTICLE 8. DISPUTE RESOLUTION**

- 8.0 The parties agree that, in the event of a dispute between the parties, HEC and DOC/NOAA/NWS shall use their best efforts to resolve that dispute at the working level in an informal fashion through consultation, coordination, and communication, or other forms of non-binding alternative dispute resolution mutually acceptable to the parties. In the event that such informal means cannot resolve the dispute, the issue will be raised to the agreement signatory level for final resolution.

## **ARTICLE 9. DISSEMINATION OF INFORMATION**

- 9.0 Public Information. Prior to releasing information to the public through the Freedom of Information Act, 5 U.S.C. 552, or otherwise, regarding work undertaken pursuant to this MOA, HEC and the DOC/NOAA/NWS shall make reasonable efforts to coordinate and consult with each other.
- 9.1 Information to Congress. HEC and DOC/NOAA/NWS share joint responsibility for providing information to Congress related to this project, if necessary.

**ARTICLE 10. APPLICABLE LAWS AND REGULATIONS**

- 10.0 This MOA, and any work performed hereunder, is subject to the laws of the United States, and the delegated authority assigned to each party. Nothing in this MOA shall be construed as obligating either agency to the expenditure of funds or for future payment of money in excess of appropriations authorized by law.

**ARTICLE 11. LIABILITY**

- 11.0 The Government agrees to promptly consider and adjudicate any and all claims which may arise out of use by the Government, duly authorized representatives, or contractors of the Government, and to pay for any damage or injury as may be required by Federal law. Such adjudication will be pursued under the Federal Tort Claims Act, 28 U.S.C. Section 2671 et seq., or such other legal authority as may be pertinent. The Government also agrees to consider and adjudicate any claims for property damage or personal injury sustained by Government personnel in the performance of their official duties. Such adjudication will be pursuant to the Federal Tort Claims Act, The Federal Employees Compensation Act, 5 U.S.C. Section 8101 et seq., or such other legal authority as may be pertinent.

**ARTICLE 12. MISCELLANEOUS**

- 12.0 Other Relationships or Obligations. This MOA shall not affect any pre-existing or independent relationships or obligations between the parties.
- 12.1 Survival. The provisions of this MOA, which require performance after the expiration or termination of this MOA, shall remain in force notwithstanding the expiration or termination of this MOA.
- 12.2 Severability. If any provision of this MOA is determined to be invalid or unenforceable, the remaining provisions shall remain in force and unaffected to the fullest extent permitted by law and regulation.

**ARTICLE 13. AMENDMENT, MODIFICATION AND TERMINATION**

- 13.0 This MOA and any WOs issued hereunder, may be modified or amended only by written mutual agreement between the parties. Either party may terminate this MOA, or any WO, by providing written notice to the other party. The termination shall be effective sixty (60) days following notice, unless a later date is set forth.

**ARTICLE 14. EFFECTIVE DATE**

14.0 This MOA shall become effective when signed by both parties and shall expire three years from that date unless terminated earlier by either party in accordance with Article 13.

IN WITNESS WHEREOF, the Parties have caused this Agreement to be executed by their duly authorized representatives as follows:

For U.S. Department of Commerce, National Oceanic and Atmospheric Administration,  
National Weather Service:

\_\_\_\_\_  
GARY M. CARTER  
Director, Office of Hydrologic Development

\_\_\_\_\_  
Date

For U.S. Army Corps of Engineers Hydrologic Engineering Center

\_\_\_\_\_  
DARRYL W. DAVIS  
Director

\_\_\_\_\_  
Date

## APPENDIX A

### **Enhancement of ResSim and Integration with NWSRFS**

The full effort associated with this MOA will be organized into two phases of work. Additionally, the Phase I and Phase II Tasks require a separate design task where the functional specifications, performance, level of effort, and timeline will be identified as the basis for Work Orders (WO) associated with implementation. Phase I and Phase II Tasks are as follows:

#### **Phase I Tasks – Basic Functionality**

- Task 1. Design of new Phase I ResSim features (Tasks 2-12).
- Task 2. Extend downstream rule logic to account for rate of change constraints.
- Task 3. Enhance induced surcharge operation logic to prevent oscillations.
- Task 4. Enhance induced surcharge operation logic to include "hold gate settings."
- Task 5. Enhance induced surcharge operation logic to add option for family of ESRD curves.
- Task 6. Add inflow factor editor.
- Task 7. Add variable contingency factor on downstream constraint.
- Task 8. Add new pre-release rule or operation method.
- Task 9. Create Linux version.
- Task 10. Provide "hot start" capabilities for integration with NWSRFS.
- Task 11. Provide for batch (headless) operation.
- Task 12. Provide guidance and support to NWS Office of Hydrologic Development related to the development of an NWSRFS – ResSim portal which will allow for the use of ResSim within the standard operations of the California-Nevada River Forecast Center. This task may also entail minor ResSim software development in order to support the interface boundary.

#### **Phase II Tasks - Support ensemble functions and operation for risk analysis**

- Task 13. Design of new Phase II ResSim features (Tasks 14-17).
- Task 14. Provide user interface, data management for ensemble application.
- Task 15. Modify to improve performance for ensemble processing.
- Task 16. Provide probabilistic information outputs (plotting and statistical analysis).
- Task 17. Provide application scripting capability to (a) create, run ensemble alternatives, (b) obtain

probabilistic info, (c) apply rule logic and assign values to inputs, (d) implement loop capability for sequence of forecasts, (e) compute and compare probability of lead time v. forecast issuance time.

**ATTACHMENT 1**  
**Work Order #1**  
**(7 February 2006)**

This Work Order (WO) is made pursuant to the Memorandum of Agreement (MOA) between the U.S Army Corps of Engineers, Institute of Water Resources, Hydrologic Engineering Center and the Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service (MOA -01-HEC-01), signed March 20, 2006.

ARTICLE 5 defines the contents for all Work Orders executed through this MOA.

5.1.1 Statement of Work

This WO instructs HEC to complete and deliver Task 1 as shown in APPENDIX A of the MOA. Specifically, this consists of developing a written work and management plan that includes for each Phase I Task (2 through 12):

- (1) a clear description of how the enhancement will function and behave,
- (2) the cost with a labor breakdown,
- (3) the anticipated delivery schedule, and
- (4) the process to validate performance and/or completion.

The goal of this work is to develop the basis for the next WO which will result in the implementation of the remaining Phase I Tasks (2-12).

5.1.2 The amount of funds is \$90,000.

5.1.3 Full payment will be made in advance and the work, identified in 5.1.1 above, will be completed within 90 days of payment.

5.1.4 Full payment will be made in advance.

5.1.5 The appropriation out of which DOC/NOAA/NWS will pay for this work is: ORF 14-06-D8M5J22-P00-37-04-04-01-005-20-03-0000-00-00-00.

5.1.6 The project managers for this WO are the Principal Representatives identified in ARTICLE 4 of the Agreement.

5.1.7 This WO requires a final report consisting of the deliverables identified in 5.1.1 above.

5.1.8 This WO does not involve government-furnished equipment. Each agency is responsible for its own contract administration, records maintenance, and contract audits. The DOC/NOAA/NWS makes no claim data, software, or intellectual property rights associated with this WO.

5.1.9 HEC warrants, pursuant to the Economy Act, that it is able to provide the ordered goods and services.

5.1.10 No other particulars are necessary to describe clearly the obligations of the parties with respect to the requested goods and services.

5.1.11 This Work Order shall expire in accordance with the expiration of the cited appropriation code, September 30, 2007.

**ATTACHMENT 2**  
**Work Order #2**  
**(16 February 2007)**

This Work Order (WO) is made pursuant to the Memorandum of Agreement (MOA) between the U.S Army Corps of Engineers (USACE), Institute for Water Resources, Hydrologic Engineering Center (CEIWR-HEC) and the Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), MOA -01-HEC-01, signed March 20, 2006.

ARTICLE 5 defines the contents for all Work Orders executed through this MOA.

5.1.1 Statement of Work

This WO instructs HEC to complete and deliver Tasks 2 through 12 with the exception of Task 8 as shown in APPENDIX A of the MOA. The Forecast-Coordinated Operations (F-CO) team decided, during WO #1, to NOT complete and deliver Task 8 as part of Phase 1. The functional design and the implementation plan for Tasks 2 through 12 (except Task 8) were delivered by HEC as a result of their completion of WO #1 (i.e., Task 1) in November 2006. Specifically, those documents are:

A.) “*HEC-ResSim Reservoir System Simulation, NOAA-NWS Yuba Feather Project Phase 1 – Functional Design*” dated 1 November 2006, and

B.) “*HEC-ResSim Reservoir System Simulation, NOAA-NWS Yuba Feather F-CO Project Phase 1 Implementation Plan*” original dated 21 November 2006, revision dated 16 February 2007.

They are attached to this WO #2. The goal of WO #2 is for HEC to execute their plan for completing Tasks 2 through 12 (except Task 8).

5.1.2 The amount of funds is **\$267,000**.

5.1.3 Full payment will be made in advance and the work, identified in 5.1.1 above, will be completed within 10 months of payment.

5.1.4 Full payment will be made in advance.

5.1.5 The appropriation out of which DOC/NOAA/NWS will pay for this work is: ORF 14-06-4RM6JYC-P00-07-04-04-01-005-20-03-0000-00-00-00-00.

5.1.6 The project managers for this WO are unchanged and are the Principal Representatives identified in ARTICLE 4 of the Agreement. However, note that there is a new Director of the USACE HEC, Christopher N. Dunn, who took over following the retirement of Darryl W. Davis in May 2006.

5.1.7 This WO requires the following deliverables.

- a. A ResSim executable program updated with the new features defined by the tasking outlined in section 5.1.1 which has passed in-house HEC unit tests and integration tests.
- b. Draft documentation of the new features in a form suitable for inclusion in the HEC-ResSim User’s Manual.

- c. Demonstrations of the new features to members of the F-CO.
- d. Test data sets and test documentation (i.e., testing methodology and outcome for each new feature) appropriate for independent testing and validation by the F-CO team.

According to the HEC implementation plan, the software deliveries and acceptance testing by the F-CO will occur in the form of four parallel tracks.

5.1.8 This WO does not involve government-furnished equipment. Each agency is responsible for its own contract administration, records maintenance, and contract audits. The DOC/NOAA/NWS makes no claim data, software, or intellectual property rights associated with this WO.

5.1.9 HEC warrants, pursuant to the Economy Act, that it is able to provide the ordered goods and services.

5.1.10 No other particulars are necessary to describe clearly the obligations of the parties with respect to the requested goods and services.

5.1.11 This Work Order shall expire in accordance with the expiration of the cited appropriation code, December 31, 2007.

IN WITNESS WHEREOF, the authorized representatives agree to and issue Work Order #2 pursuant to ARTICLE 5 and ARTICLE 13 of the MOA.

For U.S. Department of Commerce, National Oceanic and Atmospheric Administration,  
National Weather Service:

\_\_\_\_\_  
GARY M. CARTER  
Director, Office of Hydrologic Development

\_\_\_\_\_  
Date

For U.S. Army Corps of Engineers Hydrologic Engineering Center

\_\_\_\_\_  
CHRISTOPHER N. DUNN  
Director

\_\_\_\_\_  
Date

## APPENDIX A-2

**Provide Access to Execute HEC-RAS from NWS's CHPS**

**Project Background:** FLDWAV is a comprehensive hydraulic model within the NWS River Forecast System (NWSRFS) that is used to simulate unsteady flows in rivers controlled by a wide spectrum of hydraulic structures.

Many NWS River Forecast Centers (RFCs) have indicated that the current capabilities of FLDWAV do not meet all of their requirements, and that alternatives to FLDWAV are needed in order to provide accurate and timely river forecasts. One such desirable alternative is within the River Analysis System (RAS), developed by the US Army Corps of Engineers (USACE) Hydrologic Engineering Center (HEC); this system of models is referred to as the "HEC-RAS".

The HEC-RAS engine runs on the Microsoft Windows and Sun Solaris (UNIX) operating systems. However, the associated full-capability HEC-RAS GUI is written in Visual Basic for Windows, which is not compatible with the RFC operational Linux-based NWS AWIPS computer systems. The HEC has no current plans to convert the GUI to Java for use on UNIX systems; furthermore, NWS AWIPS security policy prohibits RFCs from connecting Windows-based computers to the operational network.

The HEC does have a limited-capability Unix-based GUI (written in JAVA), which is intended for use with operational forecast runs, and is not designed for - or suitable for - full model development and calibration. This GUI will be referred to as the HEC-RAS Real-Time Forecasting Interface (RAS-RTFI). A potential solution for the NWS might therefore be to use the limited-capability Unix-based RAS-RTFI for RFC forecasting operations, and use the full-capability Windows-based GUI for offline model development and calibration outside the AWIPS operational environment. Data generated during model development and calibration could be transferred periodically through the AWIPS firewall for use during forecasting operations.

The NWSRFS, in use at all 13 NWS RFCs, is scheduled to undergo a complete modernization during the next 3-5 years. OHD's replacement for the NWSRFS, the Community Hydrologic Prediction System (CHPS), will be based on service-oriented architecture (SOA) concepts. A prototype for CHPS, featuring the WL | Delft Hydraulics' Flood Early Warning System (Delft-FEWS), is currently under evaluation at a small number of RFCs. Given the amount of resources that would be required to integrate the HEC-RAS into the existing NWSRFS environment, and in light of the recent progress on CHPS, NWS's OHD desires to link the HEC-RAS into CHPS in a manner very similar to that used for the ResSim project described in APPENDIX A of this MOA. The extensible nature of the SOA adapter design for the ResSim project is expected to facilitate linkage of HEC-RAS into the Delft-FEWS environment. Note the use of the term linkage denotes the fact that OHD desires to execute the HEC-RAS model in operations yet maintain HEC's complete control over the source code just as in the aforementioned ResSim project.

Figure 1 illustrates a proposed conceptual solution.

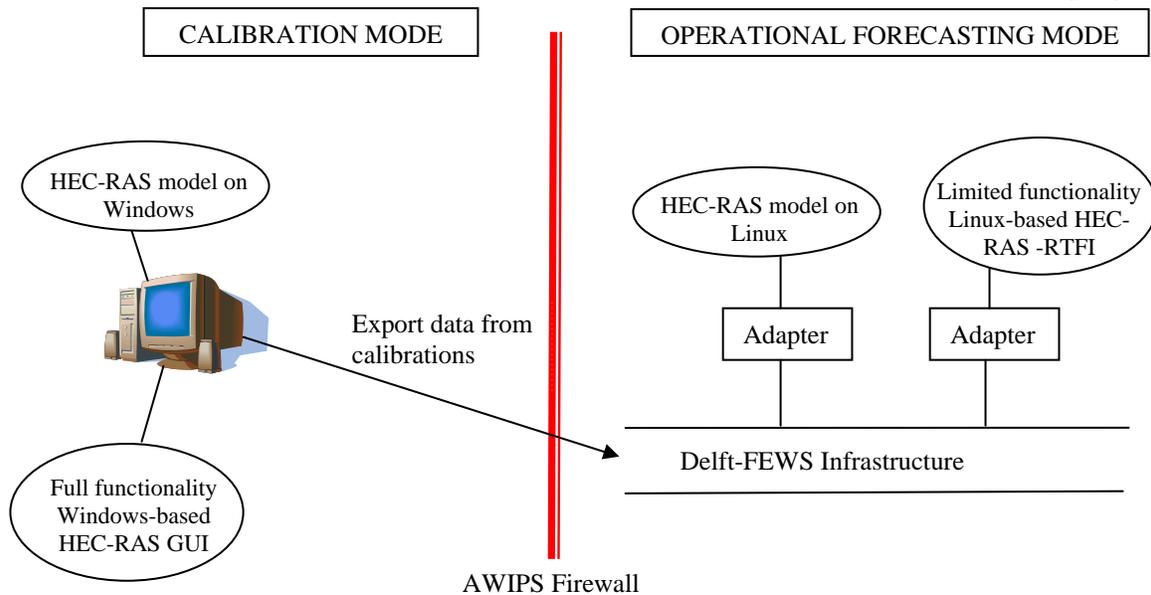


Figure 1: Proposed conceptual solution

**Project Task Definition:** The work on this project within the MOA will be organized into two principal tasks. Task 1 will encompass all analysis work necessary to define the level of effort required for Task 2. One or more Work Orders (WOs) will be constructed to guide the work for each of the two Tasks.

Task 1. Analyze the problem domain and create an implementation plan, including:

- a.) Consult with WL | Delft Hydraulics of Delft, The Netherlands to identify all HEC tasks required to develop new, or modify existing, HEC software such that it will interface with Delft-FEWS and will permit the NWS RFCs to run the HEC-RAS in their operational forecasting system environment (i.e., CHPS). Note the operational system at the RFCs is based on the RHEL Linux operating system.
- b.) Based on the outcome of a.) above, identify and document any necessary changes to the conceptual solution approach shown in Figure 1.
- c.) Develop a plan (including a Work Breakdown Structure (WBS), schedule, work task dependencies, risk identification and mitigation) to implement the solution identified during the course of a.) above. This plan will form the basis for all HEC activities in Task 2.
- d.) Consult, when required, with Apex Digital Systems, Inc. of Silver Spring, MD, who is under contract with NWS OHD to manage all activities associated with Task 1.
- e.) Deliver the implementation plan to NWS OHD.

Task 2. Implement the tasks identified in Task 1

Activities for Task 2 will be identified during the course of Task 1. Upon completion of Task 1 this document will be updated.

**ATTACHMENT 1 for APPENDIX A-2**  
**Work Order #1 for APPENDIX A-2**  
**(2 August 2007)**

This Work Order (WO) is made pursuant to the Memorandum of Agreement (MOA) between the US Army Corps of Engineers, Institute of Water Resources, Hydrologic Engineering Center and the Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service (MOA -01-HEC-01), signed March 20, 2006.

ARTICLE 5 defines the contents for all Work Orders executed through this MOA.

#### 5.1.1 Statement of Work

This WO instructs HEC to complete and deliver Task 1 as shown in APPENDIX A-2 of the MOA. Specifically, this consists of developing an implementation plan that includes for Task 2:

- (1) An updated conceptual solution approach, using Figure 1 above as the basis,
- (2) The cost of the project with a labor category breakdown,
- (3) The anticipated project delivery schedule, and
- (4) The process to validate performance and/or completion.

The goal of this work is to develop the basis for the next WO which will result in the implementation of the Task 2.

5.1.2 The amount of funds is **\$68,000**.

5.1.3 Full payment will be made in advance and the work, identified in 5.1.1 above, will be completed within **90 days** of payment.

5.1.4 Full payment will be made in advance.

5.1.5 The appropriation out of which DOC/NOAA/NWS will pay for this work is: ORF 14-07-E8M5JHP-P00-85-04-04-02-001-20-03-0000-91-01-00-00

5.1.6 The project managers for this WO are the Principal Representatives identified in ARTICLE 4 of the Agreement except for DOC/NOAA/NWS where he is:

Jon M. Roe  
NOAA/NWS/OHD  
1325 East-West Highway, 8310  
Silver Spring, MD 20910

Phone: 301-713-0640, Ext. 104  
Email: [Jon.Roe@noaa.gov](mailto:Jon.Roe@noaa.gov)

5.1.7 This WO requires a final report consisting of the deliverables identified in 5.1.1 above.

5.1.8 This WO does not involve government-furnished equipment. Each agency is responsible for its own contract administration, records maintenance, and contract audits. The DOC/NOAA/NWS makes no claim to data, software, or intellectual property rights associated with this WO.

5.1.9 HEC warrants, pursuant to the Economy Act, that it is able to provide the ordered goods and services.

5.1.10 No other particulars are necessary to describe clearly the obligations of the parties with respect to the requested goods and services.

5.1.11 This WO shall expire in accordance with the expiration of the cited appropriation code, September 30, 2008

IN WITNESS WHEREOF, the authorized representatives agree to and issue Work Order #1 for APPENDIX A-2 pursuant to ARTICLE 5 and ARTICLE 13 of the MOA.

For U.S. Department of Commerce, National Oceanic and Atmospheric Administration,  
National Weather Service:

\_\_\_\_\_  
GARY M. CARTER  
Director, Office of Hydrologic Development

\_\_\_\_\_  
Date

For U.S. Army Corps of Engineers Hydrologic Engineering Center

\_\_\_\_\_  
CHRISTOPHER N. DUNN  
Director

\_\_\_\_\_  
Date

**ATTACHMENT 2 for APPENDIX A-2****Work Order #2 for APPENDIX A-2****[[[PURELY A PLACE HOLDER UNTIL WE NEED IT!]]]****(dd month 2008)**

This Work Order (WO) is made pursuant to the Memorandum of Agreement (MOA) between the U.S Army Corps of Engineers (USACE), Institute for Water Resources, Hydrologic Engineering Center (CEIWR-HEC) and the Department of Commerce (DOC), National Oceanic and Atmospheric Administration (NOAA), National Weather Service (NWS), MOA -01-HEC-01, signed March 20, 2006.

ARTICLE 5 defines the contents for all Work Orders executed through this MOA.

#### 5.1.1 Statement of Work

This WO instructs HEC to complete and deliver Task 2 as shown in APPENDIX A-2 of the MOA.

An implementation plan for this WO (i.e., Task 2) was delivered by HEC as a result of their completion of WO #1 (i.e., Task 1) in **[[[DATE TBD]]]**. A copy of the plan is attached to this WO #2. The goal of WO #2 is for HEC to execute their plan for completing Task 2. Specifically, this consists of:

**[[[TBD]]]**

5.1.2 The amount of funds is **\$xxx,000**.

5.1.3 Full payment will be made in advance and the work, identified in 5.1.1 above, will be completed within **xx months** of payment.

5.1.4 Full payment will be made in advance.

5.1.5 The appropriation out of which DOC/NOAA/NWS will pay for this work is: **ORF 14-06-4RM6JYC-P00-07-04-04-01-005-20-03-0000-00-00-00-00** **[[[NWS OHD to validate]]]**.

5.1.6 The project managers for this WO are the Principal Representatives identified in ARTICLE 4 of the Agreement except for DOC/NOAA/NWS where he is:

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NOAA/NWS/OHD  
1325 East-West Highway, 8310  
Silver Spring, MD 20910

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5.1.7 This WO requires deliverables such as the following **[[[DETAILS TBD]]]**.

- a. One or more RAS executable programs updated and configured as defined by the tasking outlined in section 5.1.1 of this WO which has passed in-house HEC unit tests and integration tests.
- b. Updated user documentation and training material for use by NWS RFC personnel.
- c. Demonstration to NWS OHD of the enhanced/modified HEC-RAS.
- d. Test data sets and test documentation (i.e., testing methodology and outcome) appropriate independent testing and validation by NWS OHD.

**According to the HEC implementation plan, the software deliveries and acceptance testing will occur in the form of TBD.**

5.1.8 This WO does not involve government-furnished equipment. Each agency is responsible for its own contract administration, records maintenance, and contract audits. The DOC/NOAA/NWS makes no claim to data, software, or intellectual property rights associated with this WO.

5.1.9 HEC warrants, pursuant to the Economy Act, that it is able to provide the ordered goods and services.

5.1.10 No other particulars are necessary to describe clearly the obligations of the parties with respect to the requested goods and services.

5.1.11 This Work Order shall expire in accordance with the expiration of the cited appropriation code, **month dd, yyyy.**

IN WITNESS WHEREOF, the authorized representatives agree to and issue Work Order #2 for APPENDIX A-2 pursuant to ARTICLE 5 and ARTICLE 13 of the MOA.

For U.S. Department of Commerce, National Oceanic and Atmospheric Administration,  
National Weather Service:

\_\_\_\_\_  
GARY M. CARTER  
Director, Office of Hydrologic Development

\_\_\_\_\_  
Date

For U.S. Army Corps of Engineers Hydrologic Engineering Center

\_\_\_\_\_  
CHRISTOPHER N. DUNN  
Director

\_\_\_\_\_  
Date